PATENT SPECIFICATION

(11) 1 350 070

1 350 070

(21) Application No. 45195/70 (22) Filed 23 Sept. 1970
(23) Complete Specification filed 10 June 1971
(44) Complete Specification published 18 April 1974
(51) International Classification C23B 5/68 // 5/70
(52) Index at acceptance
C7B A2A3 A2C3 A2C4X A5

(72) Inventors WILLEM LUTTMER
JOHN EDWARD ROBINSON

(19)

(54) IMPROVEMENTS IN OR RELATING TO THE ELECTROLYTIC DEPOSITION OF METALS

(71) We, INTERNATIONAL COMPUTERS LIMITED, a British Company, of ICL House, Putney, London, S.W. 15, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the electrolytic deposition of metals.

It has previously been proposed to deposit electrolytically a layer of metal on to an object of a different metal by supporting the object in a tank containing a suitable electrolyte. By connecting the object to a negative potential and inserting an electrode carrying a positive potential into the electrolyte current is caused to flow producing an electrolytic deposition on the metal object.

Difficulty has been experienced, when it is required to deposit a layer of metal on to a large number of discrete metallic elements supported in an insulating material, in providing electrical connections between each of the metallic elements and the negative potential.

According to the present invention a method of electro-plating the ends of a plurality of electrical contact springs, each sealed in a block of electrically insulating material and each extending between opposed faces of the block includes the steps of providing a tank having a dividing wall separating the tank into a first chamber and a second chamber, the wall having an opening communicating with both chambers; providing a pair of electrodes, one in each chamber; sealing the block of electrically insulating material in the opening with said opposed faces respectively exposed in each chamber; providing a plating electrolyte in the first chamber in contact with one of the electrodes and with one end of each contact spring; providing an electrically conductive liquid in said second chamber making contact with the other of the electrodes and the other end of each contact spring, the electrically conductive liquid being chemically inert with respect to the contact springs and ineffective during the electro-plating to cause electrolytic action between itself and the other ends of the contact springs; and connecting a source of plating current to the electrodes to cause the ends of the contact springs exposed in the first chamber to be electro-plated.

Apparatus in accordance with the present invention will now be described, by way of example, with reference to the accompanying drawing which shows a sectional view of plating apparatus for electrolytically depositing metal on the ends of contact springs.

Referring to the drawing the apparatus includes a tank 1 which is divided by a wall 2 into an auxiliary chamber 3 and a plating bath 4. It is preferred that the tank 1 and the wall 2 are both constructed of an insulating material which will not chemically react with the solutions, to be described, which will be retained in the tank. Alternatively the tank and the wall may be covered by a layer of insulating material. An aperture 5 situated in the wall 2 is of a size suitable to accommodate a contact block 6 consisting of a block of resilient insulating material containing sealed therein a plurality of contact springs 7, which may be formed from beryllium copper for example, passing through the block, the ends 7A, 7B of the contact springs being substantially flush with opposed surfaces of the block 6. The contact block 6 is supported in the aperture 5 by a grommet 8 which provides a liquid tight seal between the contact block 6 and the edges of the aperture 5 in the wall 2. It is required that the material from which the grommet is formed does not chemically react with either of the solutions contained

[Price 25p]

in the chamber 3 and the plating bath 4.

An electrode 9, in the form of a carbon rod, for example, is immersed in an electrically conductive liquid 10 in the auxiliary chamber 3. It is a necessary requirement that the electrically conductive liquid 10 does not react chemically with the material from which the contacts 7 are formed. That is the electrically conductive liquid must not remove metal from the contact springs 7. Furthermore, the electrically conductive liquid must not cause anodic oxidation. It is therefore preferred to use a highly concentrated alkaline solution which has a specic gravity which is preferably at 50°C in excess of 1.2.

In practice the following solution has been used:—

Sodium carbonate Na_2CO_3 anhydrous 250g/L

Tri-sodium phosphate Na_3PO_4 anhydrous 150 g/L

Sodium hydroxide NaOH 10g/l

Surface active agent 0.2ml/L approx.

The pH of the above buffered solution is of the order of 12.5. It is possible to dilute the solution. However if such a solution is diluted excessively severe polarisation of the contact springs 7 can occur due to anodic oxidation resulting in a rapid reduction in plating current. The above solution is preferably used at 50°C.

An electrode 12, also in the form of a carbon rod, for example, is immersed in an electrolyte solution 13 contained in the plating bath 4 of the tank 1. The electrolyte 13, which covers face 14 of the contact block 6, contains a salt in solution of the metal it is required to deposit on the ends of the contact springs 7 at the face 14 of the contact block 6. If, for example, it is desired to deposit copper on the ends 7A of the contact springs 7 the electrolyte 13 could contain copper sulphate in solution.

In operation a plating current is applied to the electrodes 9 and 12, the polarity being such that electrode 9 becomes a cathode and electrode 12 becomes an anode. The electrically conductive liquid 10 contained in chamber 3 of the tank serves to provide an electrical connection between the cathode 9 and each of the ends 7B of the contact springs 7 at the surface 11 of the contact block 6. The opposite ends of each contact spring 7 at the surface 14 of the contact block, being in contact with electrolyte 13 containing the plating solution in plating bath 4, effectively become cathodes and a layer of the required metal is thereby deposited on these ends. When sufficient metal has been deposited on the ends of the contact springs at surface 14, the contact block may be reversed in the aperture 5 so that the surface 11 now faces into the plating bath 4 containing the plating solution so enabling a layer of the required metal to be deposited on the opposite ends 7A, 7B, of the contact springs 7 at the surface 11. It will be realised of course that in order to reverse the contact block in the aperture it will be necessary to empty both the auxiliary chamber and the plating bath before removing the contact block.

In practice it has been found that in plating the ends of springs with a cross sectional area of 0.005 x 0.002 ins. arranged on a square matrix in which the pitch of the springs is 0.010 ins, a plating current of approximately 200 amperes per square foot was effective to deposit a layer of metal of approximately 0.0002-0.0003 ins. per minute. It is to be noted that in this case, with contacts of this order of size, the metal layers are distributed over the contact spring ends in the form of domes rather that flat layers.

In some circumstances it may be required initially to electro-deposit more than one layer, for example, a layer of copper followed by a layer of gold or alternatively a layer of nickel followed by a layer of silver. However, it will be understood that the formation of layers of different materials will each require a plating bath of the appropriate composition.

The electrodes 9 and 12 are described as carbon rods. It will be appreciated that other materials may, however, be used. For example, the electrodes may be of platinum or platinised titanium, and such electrodes are insoluble in the electrolytes used, and one anode, for example, could be used for all plating solutions, such as copper, nickel or gold. The anode may alternatively be of a soluble material, but in this case, of course, the anode should be of the same composition as the material to be deposited. Thus a copper anode would be used for copper plating, a nickel anode for nickel plating and so on.

WHAT WE CLAIM IS:—

1. A method of electro-plating the ends of a plurality of electrical contact springs, each sealed in a block of electrically insulating material and each extending between opposed faces of the block including the steps of providing a tank having a dividing wall separating the tank into a first chamber and a second chamber, the wall having an opening communicating with both chambers; providing a pair of electrodes, one in each chamber; sealing the block of electrically insulating material in the opening with said opposed faces respectively exposed in each chamber; providing a plating electrolyte in the first chamber in contact with one of the electrodes and with one end of each contact spring; providing an electrically conductive liquid in said second chamber

making contact with the other of the electrodes and the other end of each contact spring, the electrically conductive liquid being chemically inert with respect to the contact springs and ineffective during the electro-plating to cause electrolytic action between itself and the other ends of the contact springs; and connecting a source of plating current to the electrodes to cause the ends of the contact springs exposed in the first chamber to be electro-plated.

2. A method as claimed in Claim 1 in which after electro-plating said one end of each contact spring, said one end of each contact spring is exposed to said conductive liquid and said other end of each contact spring is exposed to said electrolyte; and in which the plating current is applied to cause said other end of each contact spring to be electro-plated.

3. A method as claimed in Claim 1 or 2 in which the ends of the contact springs are substantially flush with said opposed faces and the plating current source provides a plating current density such that a layer of electroplated metal is distributed over those ends in contact with the plating electrolyte in the form of domes.

4. A method as claimed in any preceding claim in which said electrically conductive liquid is a highly concentrated alkaline solution having at 50°C a specific gravity in excess of 1.2.

5. A method of electroplating the ends of a plurity of electrical contact springs substantially as hereinbefore described with reference to the accompanying drawing.

R. V. P. LOUGHREY,

Chartered Patent Agent.
Agent for the Applicant.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1974.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1350070 COMPLETE SPECIFICATION

1 SHEET This drawing is a reproduction of the Original on a reduced scale